

8.2 and 8.3 Graphing Rational Functions

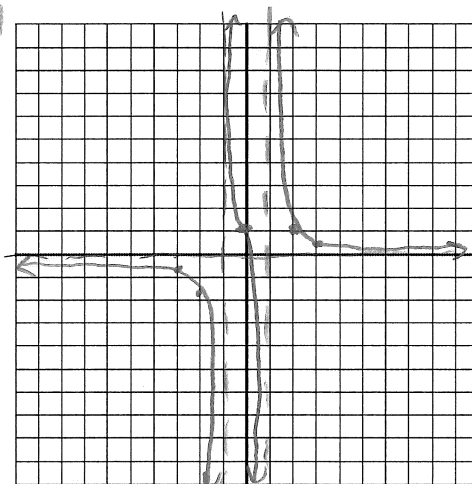
For each rational equation, find the domain and range, vertical asymptote(s), horizontal asymptote, a table of values, and graph the function.

1. $y = \frac{2x-1}{x^2-1}$

Domain: \mathbb{R} except ± 1
Range: \mathbb{R} except 0

Vertical asymptote: $x = \pm 1$
horizontal asymptote: $y = 0$

x	y
-3	-0.875
-2	-1.67
-1	error
0	1
1	error
2	1
3	.625

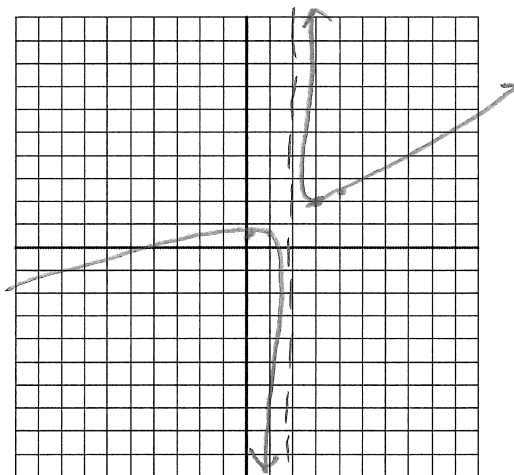


2. $y = \frac{x^2-3}{3x-6}$

Domain: \mathbb{R} except 2
Range: \mathbb{R}

Vertical asymptote: $x = 2$
horizontal asymptote: none

x	y
0	.5
1	.67
2	error
3	2
4	2.167

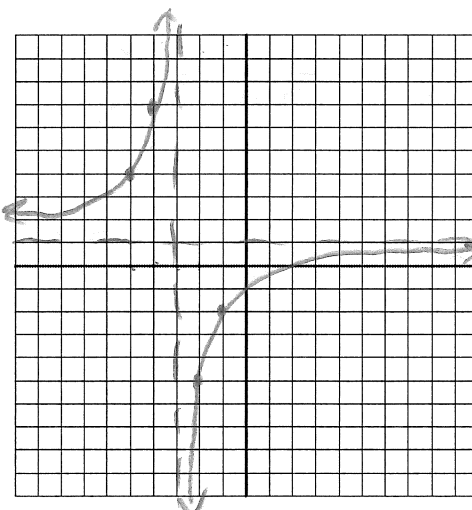


3. $y = \frac{x-3}{x+3}$

Domain: \mathbb{R} except -3
Range: \mathbb{R} except 1

Vertical asymptote: $x = -3$
horizontal asymptote: $y = 1$

x	y
-5	4
-4	7
-3	error
-2	-5
-1	-2



8.4 Multiplying and Dividing Rational Expressions

Multiply or divide each rational expression to simplify.

$$4. \frac{2x+10}{x^2+10x+25} = \frac{2\cancel{(x+5)}}{(\cancel{x+5})(x+5)} = \boxed{\frac{2}{x+5}}$$

$$5. \frac{x^2-2x-24}{x^2+7x+12} \cdot \frac{x^2-1}{x-6} = \frac{(\cancel{x-6})(\cancel{x+4})(x+1)(x-1)}{(\cancel{x+4})(x+3)(\cancel{x-6})}$$
$$= \boxed{\frac{(x+1)(x-1)}{x+3}}$$

$$6. \frac{4x^2-2x}{x^2+5x+4} \div \frac{2x}{x^2+2x+1} = \frac{2x(2x-1)(x+1)(\cancel{x+1})}{(x+4)(\cancel{x+1})2x}$$
$$= \boxed{\frac{(2x-1)(x+1)}{x+4}}$$

8.5 Adding and Subtracting Rational Expressions

Add or subtract each rational expression to simplify. Remember to find a common denominator!

$$7. \frac{1}{x^2+5x+4} + \frac{5x}{3x+3}$$

$$\frac{1}{(x+4)(x+1)} + \frac{5x}{3(x+1)}$$

$$\frac{3}{3(x+4)(x+1)} + \frac{5x(x+4)}{3(x+4)(x+1)}$$

$$\boxed{\frac{5x^2 + 20x + 3}{3(x+4)(x+1)}}$$

$$8. \frac{5x}{x^2-x-6} + \frac{4}{x^2+4x+4}$$

$$\frac{5x}{(x-3)(x+2)} + \frac{4}{(x+2)(x+2)}$$

$$\frac{5x(x+2)}{(x-3)(x+2)^2} + \frac{4(x-3)}{(x-3)(x+2)^2}$$

$$\boxed{\frac{5x^2 + 14x - 12}{(x-3)(x+2)^2}}$$

$$9. \frac{5y}{y^2-7y} - \frac{4}{2y-14}$$

$$\frac{5y}{y(y-7)} - \frac{4}{2(y-7)}$$

$$\frac{10y}{2y(y-7)} - \frac{4y}{2y(y-7)}$$

$$\frac{6y}{2y(y-7)} = \boxed{\frac{3}{y-7}}$$

$$10. \frac{x+2}{x-1} - \frac{x-3}{2x-2}$$

$$\frac{x+2}{x-1} - \frac{x-3}{2(x-1)}$$

$$\frac{2(x+2)}{2(x-1)} - \frac{(x-3)}{2(x-1)}$$

$$\frac{2x+4-x+3}{2(x-1)}$$

$$\boxed{\frac{x+7}{2(x-1)}}$$

8.6 Solving Rational Equations

Solve each of the rational equations. Don't forget to check your solutions!

$$11. \frac{2}{3x-5} = \frac{4}{x-15}$$

$$\begin{aligned} 4(3x-5) &= 2(x-15) \\ 12x-20 &= 2x-30 \\ 10x &= -10 \end{aligned}$$

$$\boxed{x = -1}$$

$$12. \frac{1}{x-5} = \frac{x}{x^2-25}$$

$$x(x-5) = x^2-25$$

$$x^2-5x = x^2-25$$

$$5x = 25$$

$$x = 5$$

$\boxed{\text{no solution}}$

$$13. \frac{2}{x-1} = \frac{x+4}{3}$$

$$6 = (x-1)(x+4)$$

$$6 = x^2 + 3x - 4$$

$$0 = x^2 + 3x - 10$$

$$0 = (x+5)(x-2)$$

$$\boxed{x = -5 \text{ or } x = 2}$$

$$14. \frac{10}{2y+8} - \frac{7y+8}{y^2-16} = \frac{-8}{2y-8}$$

$$2(y+4)(y-4) \left[\frac{10}{2(y+4)} - \frac{7y+8}{(y+4)(y-4)} = \frac{-8}{2(y-4)} \right]$$

$$10(y-4) - 2(7y+8) = -8(y-4)$$

$$10y - 40 - 14y - 16 = -8y + 32$$

$$4y = 24$$

$$\boxed{y = 6}$$

$$15. \frac{2}{x+3} - \frac{1}{x} = \frac{-6}{x^2+3x}$$

$$2x - (x+3) = -6$$

$$x - 3 = -6$$

$$x = -3$$

$\boxed{\text{no solution}}$